

NON-PUBLIC?: N  
ACCESSION #: 8809010336  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Peach Bottom Atomic Power Station - Unit 2 PAGE: 1 of 9

DOCKET NUMBER: 05000277

TITLE: Failure of Capacitors Associated with the #1 Bus Tie Line 'A' Phase  
Potential Transformer due to Normal Wear which Resulted in a Voltage  
Disturbance and ESF Actuations  
EVENT DATE: 07/29/88 LER #: 88-020-00 REPORT DATE: 08/26/88

OTHER FACILITIES INVOLVED:  
FACILITY NAME: PBAPS Unit 3 DOCKET #: 05000278

OPERATING MODE: N POWER LEVEL: 000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
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TELEPHONE #: 215-841-5048

COMPONENT FAILURE DESCRIPTION:  
CAUSE: X SYSTEM: FK COMPONENT: CAP MANUFACTURER: 0000  
REPORTABLE TO NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On July 29, 1988 at 1858 hours, the capacitors which connect the 500kV #1 bus tie line to the 'A' phase Potential Transformer failed. This failure resulted in a fire of the Potential Transformer at the North Substation and a voltage disturbance which ultimately resulted in several Engineered Safety Feature actuations on Units 2 and 3 and a partial loss of telephone communications at PBAPS. The event is reportable under 50.73(a)(2)(iv). The cause of the capacitors to fail was due to normal wear. All systems were returned to normal by 2103 hours. The Potential Transformer was replaced and returned to service on August 2, 1988. The duration of the event was 125 minutes. There were no adverse consequences of this event which would have affected plant safety. All Unit 2 and 3 RPS and PCIS logics functioned as expected. During the month prior to the event, the Potential Transformer had been identified as giving erroneous readings. Due to the high load demand, the transformer units

were not taken out of service for inspection. Therefore, no action to prevent recurrence will be taken.

(End of Abstract)

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Unit Conditions Prior to the Event:

Electrical Distribution: All 13kV Unit Auxiliary buses on #1 Startup Feed Bus from 2SU Startup Transformer Switchgear.

4kV Buses were being fed from 3SU Regulating Transformer Switchgear except for the E33 and E42 Buses, which were blocked for maintenance.

The E-2 and E-4 diesel generators, and Emergency Cooling Water (ECW) pump were blocked for maintenance.

Unit 2: Cold Shutdown Condition.

2'C' Residual Heat Removal (RHR) pump in Shutdown Cooling Mode.

2'A' Reactor Water Cleanup (RWCU) pump and 2'A' Control Rod Drive (CRD) pump in service.

2'B' Reactor Protection System (RPS) Bus on alternate feed.

Standby Gas Treatment System (SBGTS) was blocked for maintenance.

Unit 3: Refuel Mode with Core Offloaded.

'A' Channel auto-scam and Manual scam inserted.

3'A' RPS Bus on alternate feed.

Description of the Event:

On July 29, 1988 at 1858 hours, the capacitors which connect the 500kV #1 bus tie line to the 'A' phase Potential Transformer failed. This failure resulted in a fire of the Potential Transformer at the North Substation and a voltage disturbance

which ultimately resulted in several Engineered Safety Feature actuations on Units 2 and 3 and a partial loss of telephone communications at PBAPS. On Unit 2 these actuations were a Channel 'A' half scram, a Group II and III isolation, and a Reactor Building ventilation inboard isolation. On Unit 3, the actuations were an automatic scram, a Group I, II and III isolation and a Reactor Building ventilation isolation. The event is reportable under 50.73(a)(2)(iv).

At the time of the event, the 13kV Buses were being fed from the 2SU Startup Transformer Switchgear through the #1 Startup Feed Bus (See attached PBAPS single line diagram, E-1). The 4kV Buses were being fed from the 3SU Regulating Transformer Switchgear through breaker 3SU-E. The first indications of the event in the Control Room were a North Substation general alarm annunciator and a 5007 line transfer trip low signal alarm on the substation breaker supervisory console which occurred at 1858 hours. Additionally, the Control Room received a report of a fire at the North Substation. Plant personnel were dispatched to the North Substation to investigate. The 15 and 25 ring bus breakers at the North Substation and 205 and 235 ring bus breakers at the South Substation tripped, isolating the #1 bus tie line and the Potential Transformer. The voltage disturbance caused the 4kV emergency bus undervoltage relays to trip their respective feeder breakers, except for the E322 breaker which did not trip. Due to the loss of power at the 4kV Buses, a fast transfer of power to the 2SU Startup Transformer Switchgear under normal circumstances should have occurred; however, the 4kV Bus (No. 00A19) was blocked due to maintenance by opening breaker 2SU-E. Therefore, the E-1 and E-3 Diesel Generators (DG) auto-started on 4kV Bus undervoltage.

The E-2 and E-4 Diesel Generators did not auto-start, since they were blocked for maintenance.

The 4kV Emergency Buses were aligned as follows:

#### Bus Feed

E12 E-1 DG  
E22 3SU-E through E322  
E32 E-3 DG  
E42 Blocked  
E13 E-1 DG  
E23 Deenergized  
E33 Blocked  
E43 Deenergized

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On Unit 2, as a result of the voltage disturbance, the 2'A' Reactor Protection System bus deenergized causing a loss-of-power to the following:

- 'A' Channel Reactor Protection System (RPS) logic
- 'A' Channel Primary Containment Isolation System (PCIS) logic
- 'A' Channel Power Range Neutron Monitors
- 'A' Channel Offgas and 'A' Channel Steam Line Radiation Monitors

This resulted in a Channel 'A' half scram, a Group II and III inboard isolation, and a Reactor Building ventilation inboard isolation. The 2'A' High Pressure Service Water Pump and 2'A' Control Rod Drive pump both tripped on E32 and E12 bus undervoltage, respectively. The 2'B' RPS Bus remained energized since the alternate feed was powered from an uninterruptible AC Power Distribution Panel. The E22 Bus never deenergized but the voltage disturbance caused a Group II and III outboard isolation.

On Unit 3, both Unit 3 RPS buses deenergized causing a loss-of-power to the following:

- 'A' and 'B' Channel RPS logic
- 'A' and 'B' Channel PCIS logic
- 'A' and 'B' Channel Power Range Neutron Monitors
- 'A' and 'B' Channel Offgas and Steam Line Radiation Monitors

This resulted in an auto-scram, a Group I, II, III isolation and a Reactor Building Ventilation Isolation.

All Unit 2 and 3 RPS and PCIS logics functioned as expected.

The isolation signals caused the following valve movement:

Unit 2

- MO-10-17, MO-10-18, MO-10-25A closed
- MO-12-15, MO-12-18 closed and the 'A' RWCU pump tripped
- AO-20-82, AO-20-94 closed
- AO-2969A closed
- Reactor Building inboard ventilation valves closed

Unit 3

- AO-20-94, AO-20-95, closed
- AO-3968, AO-3969A, AO-3969B closed
- Reactor Building ventilation valves closed

As a result of the voltage disturbance, portions of the 456 area telephone system (Delta, Pennsylvania) lost power (discussed further below). After confirmation that the Potential

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Transformer was on fire, the Delta Fire Department was contacted by the Control Room through the load dispatcher at 1905 hours and arrived at the North Substation by 1930 hours.

When it was verified that the offsite power source was reliable through the 3SU Regulating Transformer Switchgear, the E343 and E323 breakers were reclosed, reenergizing the E43 and E23 4kV Buses, respectively, by 1922 hours. Normal power to the remaining 4kV Buses, which were not blocked for maintenance, was reestablished by a dead bus transfer from the diesel generators to the 3SU Regulating Transformer Switchgear. Once all 4kV Buses were normalized at 1934 hours, the RPS Buses and the scram and isolation signals were reset by 1953 hours. The fire was extinguished by 2010 hours.

All systems were returned to normal and the telephone system was returned to service by 2103 hours. The duration of the event was 125 minutes.

As a result of this electrical transient, portions of the 456 area telephone system (Delta, Pennsylvania) lost power due to blown fuses in the GTE Delta Office. The NRC red phone, the OMNI system phones and the load dispatcher radio remained operable. The phone company was notified and the phone system was restored to service at 2103 hours. A one (1) hour notification was made under 50.72(b)(1)(v) as a result of a major loss of communications capability. A declaration of an emergency class was not made since ERP-101 requires a complete loss of all Main Control Room communications equipment, and the above mentioned communications equipment remained available.

Additionally, all Unit 2, Common and Unit 3 Area Radiation Monitors (ARMS) tripped on high and undervoltage signals causing the ARMS throughout the respective areas of the plant to alarm. The ARMS were all reset, the horns stopped alarming throughout the plant and the radiation signals on the individual ARMS returned to normal.

Consequences of the Event:

There were no adverse consequences of this event which would have affected plant safety for the reasons discussed below. All Unit 2 and 3 RPS and PCIS logics functioned as expected. At the time of the event Unit 2 was in the Cold Shutdown Condition with all rods inserted; therefore, no rod movement occurred. Unit 3 was in the Refuel Mode with the core

offloaded. The Shutdown Cooling

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Mode was out-of-service for approximately 70 minutes on Unit 2. During this time, there was no significant increase in the Unit 2 reactor coolant temperature. If a significant increase in coolant temperature had occurred, alternate paths would have been established to remove the decay heat; therefore, plant safety would not have been adversely affected as a result of this event.

The Reactor Water Cleanup (RWCU) System was out-of-service for approximately 97 minutes on Unit 2. The System was in operation on Unit 2 to maintain reactor level and primary coolant water chemistry. As a result of this event, the Unit 2 reactor level increased from 52" to 54" while the vessel was isolated, then decreased to 47" when the RHR and RWCU were returned to service and stabilized at 50" once the CRD was returned to service. These minimal fluctuations did not adversely affect nuclear fuel cooling. Additionally, if this event would have occurred during normal operation, the primary coolant system water chemistry would not have been adversely affected by the brief RWCU isolation.

The failure of the Potential Transformer and subsequent fire would not affect plant safety during power operation. The fire was not significant to the extent that other equipment at the North Substation was damaged. The North Substation does not contain any safety-related equipment. The fire was at a far enough proximity from plant equipment necessary for the safe shutdown of the plant that if the event had occurred during normal operation, plant safety would not have been adversely affected. Under operating conditions, a fast transfer of power to an alternate offsite power source would have occurred, precluding the ESF actuations. However, during this event, the alternate offsite power source to the 4kV Buses was blocked for maintenance.

The diesel generators which were not blocked at the time of the event, started as designed and provided a temporary alternate source of power.

The loss-of-power to portions of the 456 telephone exchange system (Delta, Pennsylvania) did not adversely affect the ability to contact the local fire department. The local fire department was contacted by the load dispatcher. The NRC red phone, the OMNI system phones and load dispatcher radio remained operable.

The E322 breaker did not open on undervoltage as a result of the voltage disturbance. The breaker should have opened on undervoltage to allow transfer of power to the alternate 4kV power source which, during this event, was

blocked for maintenance. If this event would have occurred during normal

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operation, and the transfer did not occur, either the existing source would continue to supply power or the diesel generator would have provided power. Otherwise, the loss-of-power to this Bus would have caused the electrical systems connected to this Bus to fail in the fail-safe position thus ensuring that plant safety would not be adversely affected.

#### Cause of the Event:

The voltage disturbance and subsequent ESF actuations were the result of a failure of capacitors which link the 500kV #1 bus tie line to the 'A' phase Potential Transformer. The capacitors failed due to normal wear. The failure of the capacitors caused a direct short between the 500kV bus to the Potential Transformer which is mounted on a stanchion. The stanchion melted and a fire resulted due to the oil in the capacitors and Potential Transformer coming in contact with the high voltage.

The cause for the E322 breaker to not open on undervoltage was not determined. Following the event, the undervoltage relay was checked and found to be within calibration and the breaker was cycled without incident. It is speculated that the breaker did not trip on undervoltage because the voltage transient was not sufficiently low enough to trip the undervoltage setting on this breaker. This breaker is due for maintenance during this outage.

#### Corrective Actions:

The 4kV Buses were normalized by 1934 hours, the RPS Buses and the scram and isolation signals were reset by 1953 hours. The fire was extinguished by 2010 hours. The final action to return the plant systems to normal was the return of the phone system to service by 2103 hours. The Potential Transformer was replaced and returned to service August 2, 1988. The duration of the event was 125 minutes.

#### Actions Taken to Prevent Recurrence:

The E322 breaker, manufactured by General Electric (Model No. AM-4.16-250), was subsequently cycled from the Main Control Room and

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functioned as designed. The degraded grid voltage relay setpoint, which controls the opening of the breaker, will be checked to ensure proper

operation of the breaker.

During the month prior to the event, the Potential Transformer had been identified as giving erroneous voltage readings. Due to the high load demand, the transformer units were not taken out of service for inspection. Therefore, no action to prevent recurrence will be taken.

#### EIIS Codes:

The EIIS codes for the systems described in this report are: BO-RHR/Low Pressure Coolant Injection System, JC-Plant Protection System, IL-Radiation Monitoring System, JM-Containment Isolation Control System, FI-Communications System, AA-Control Rod Drive System, EK-Emergency Onsite Power Supply System, BH-Emergency/Standby Gas Treatment System, EA-Medium Voltage Power System (35kV to 600V), EB-Medium Voltage Power System - Class IE, CU-Reactor Water Cleanup System, FK-Switchyard System.

The EIIS codes for the components described in this report are: ALM-Alarm, RA-Alarm, Radiation, BRK-Breaker, BU-Bus, DG-Generator, Diesel, XFMR-Transformer, V-Valve, RPV-Vessel, Reactor, SSBUS-Bus, Substation, CHA-Channel, MG-Generator Set, Motor, CAP-Capacitor.

#### Previous Similar Occurrences:

There has been one previous LER (2-86-10) concerning the failure of a transformer which resulted in Engineered Safety Feature Actuations.

Tracking Codes: B99 - Failure of Capacitors due to Normal Wear

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FIGURE OMITTED - NOT KEYABLE (DIAGRAM)

ATTACHMENT # 1 TO ANO # 8809010336 PAGE: 1 of 1

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E. P. FOGARTY August 26, 1988  
MANAGER  
NUCLEAR SUPPORT DIVISION Docket No. 50-277

Document Control Desk



U.S. Nuclear Regulatory Commission  
Washington, DC 20555

SUBJECT: Licensee Event Report  
Peach Bottom Atomic Power Station - Unit 2

This LER concerns the failure of capacitors associated with the #1 bus tie line 'A' phase Potential Transformer at the North Substation which resulted in a voltage disturbance and several Engineered Safety Feature actuations.

Reference: Docket No. 50-277  
Report Number: 2-88-20  
Revision Number: 00  
Event Date: July 29, 1988

Report Date: August 26, 1988  
Facility: Peach Bottom Atomic Power Station  
RD 1, Box 208, Delta, PA 17314

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(iv).

Very truly yours,

/s/ E. P. FOGARTY  
E. P. Fogarty  
Manager  
Nuclear Support Division

cc: W. T. Russell, Administrator, Region I, USNRC  
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